Issues Associated With Lost Cover And Concealment As Utah Juniper Populations Become Isolated

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Juniperus osteosperma

"Utah Juniper"

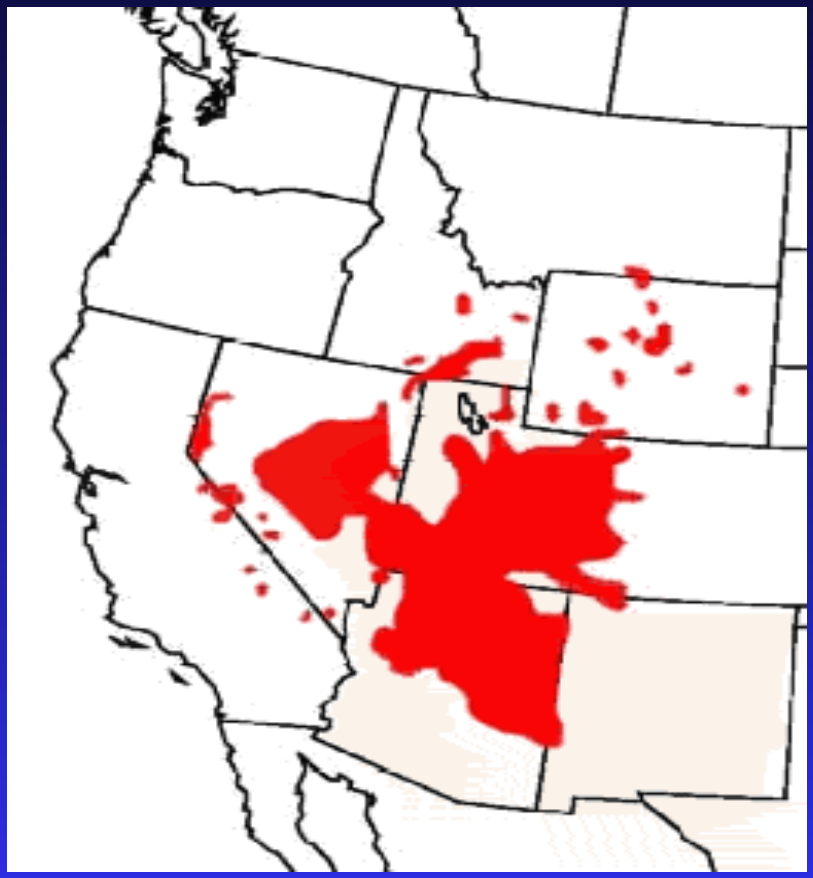
Juniperus osteosperma

Utah Juniper

- Utah juniper has a history of human usage for fuel, building materials, charcoal, nuts, and medicine.
- It is important as wildlife habitat for a number of small mammals and birds.
- It provides food for rodents, rabbits, deer and elk.

Utah Juniper

- Native to the West-central Rockies and Great Basin
- Estimated to cover 30-40 million hectares
- Commonly discussed in terms of the management of the invasive species



The problems at Dugway:

- Damage to the juniper populations due to training related fires.

The problems at Dugway

- The utah juniper populations are becoming more and more isolated from one another both in elevation and distance as a result of these fires

The problems at Dugway:

- Juniper populations are not recovering as might be expected
- Suspicion of low recruitment and poor population fitness

Initial field trip

- Only a few population juveniles
  --- 2-5 within Granite Mountain areas
  --- 20+ in Valley Population
- Berries show evidence of:
  --- parasite invasion (may be loss of genetic diversity)
  --- seed abortion (inbreeding)

Study Objectives

- Quantify the reproductive success or recovery rate of the Utah Juniper on Dugway Proving Ground
- Compare these rates to other Utah Juniper populations
- Quantify the genetic variability that exists in the Utah Juniper populations of Dugway and comparative populations
- If there is a difference in reproductive success and/or a loss of variability in the populations on Dugway, determine whether a correlation between a loss of genetic variability and reproductive success exists.

- Show that a correlation exists between a loss of genetic variability and a loss of reproductive success in the Dugway populations.

Sample Populations

Population	Location
Granite Mountain	DPG
Cedar Mountain	DPG
Dune Population	DPG
Valley Population	East of DPG
Nephi	140 miles NE

Valley and Nephi are being used as controls for comparative purposes

Two Fold Study

Juniper Berry Collection

-- Juniper berries were collected and analyzed for evidence of parasites and/or abortion.

Allozyme Markers

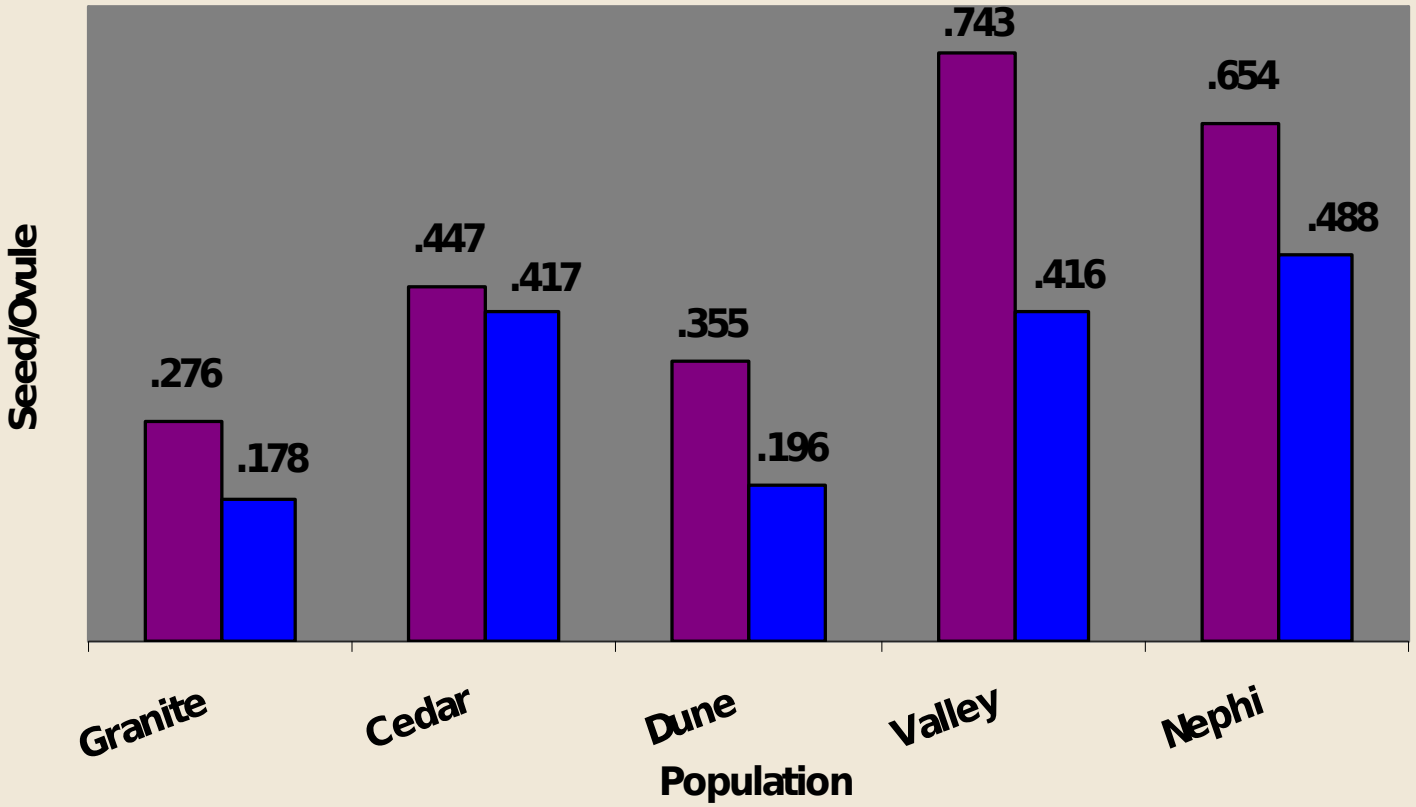
-- DNA from leaf tissue was electrophoretically run and stained with allozyme markers to assess genetic variability of populations

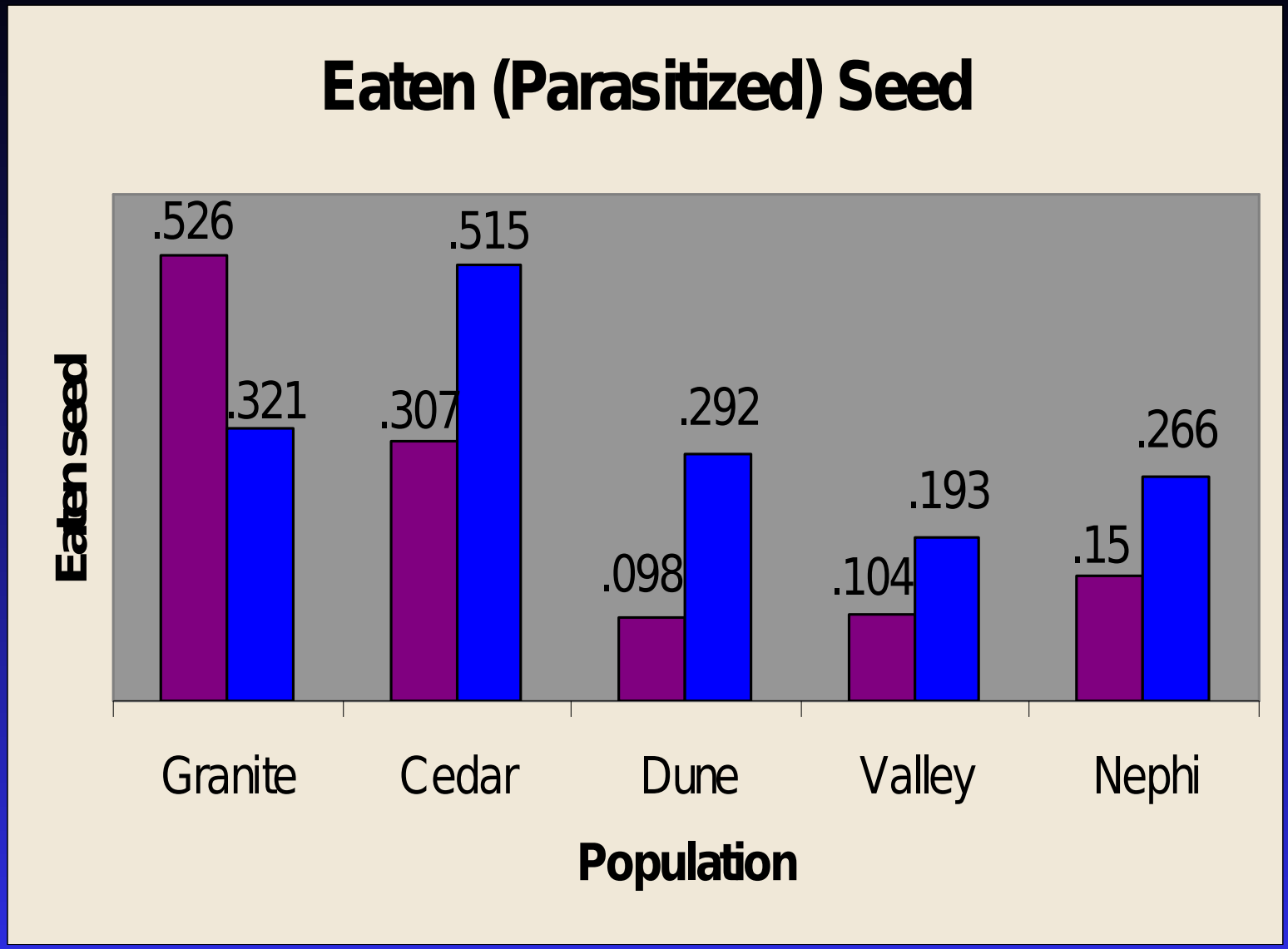
Evidence of Loss of Genetic Variability

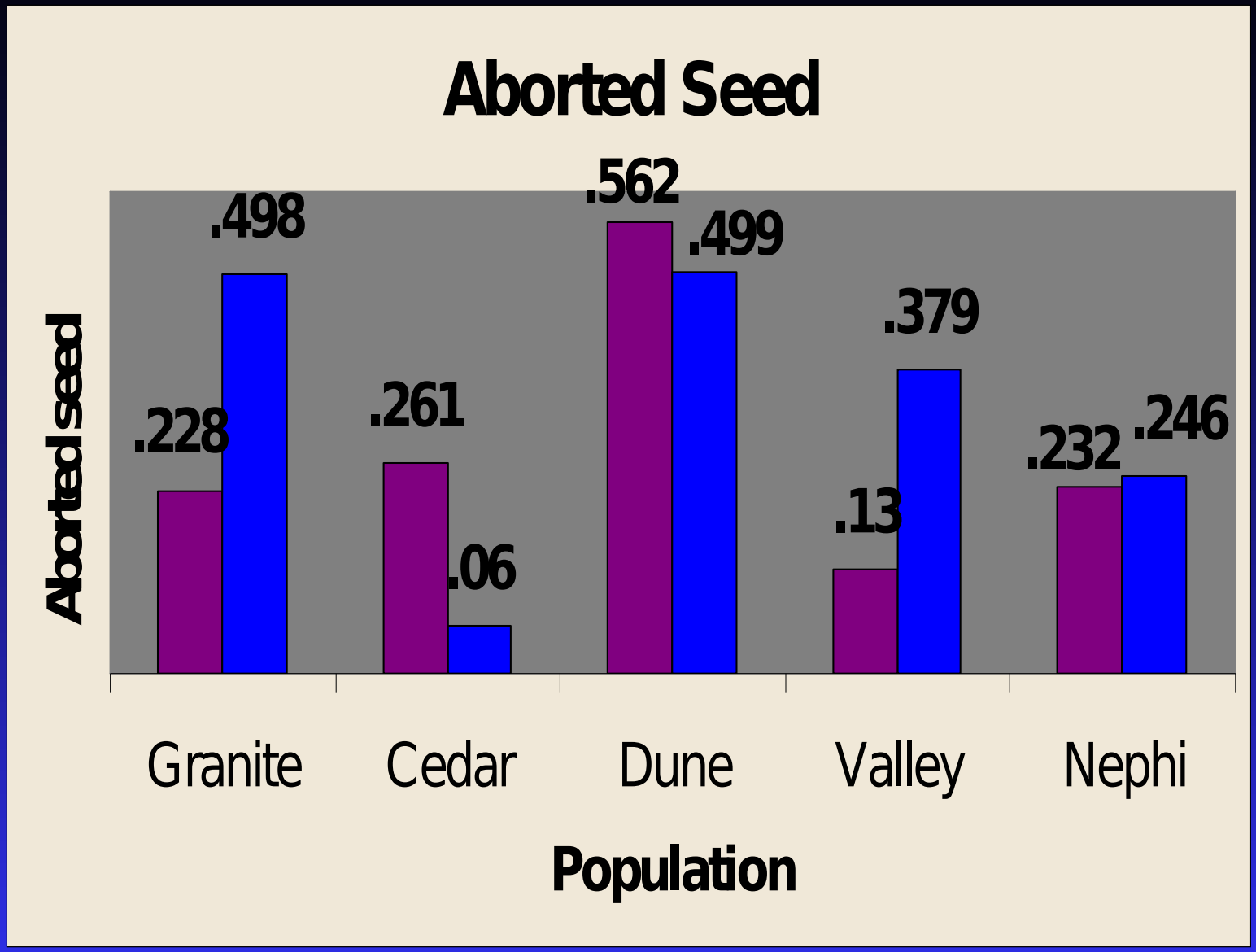
Abortion: Inbreeding has been shown to greatly increase seed abortion (Nakamara 1987)

Parasitism: Resistance to parasites has been shown to be lost with a loss of genetic diversity (Bunderson 1983)

Seed/Ovule Ratio




Eaten (Parasitized) Seed
Eaten seed
.526
.321
.307
.515
.098
.292
.104
.193
.15
.266
Granite
Cedar
Dune
Valley
Nephi
Population


Aborted Seed
Aborted seed
.228
.498
.261
.06
.562
.499
.13
.379
.232
.246
Granite
Cedar
Dune
Valley
Nephi
Population

Enzymes Used in Genetic Analysis of *Juniperus osteosperma*

Enzyme	Acronymn	Buffers	Number Loci Scored
Aldolase	ALD	11,M	1
Esterase	EST	6	1
Fructose-1,6-diphosphatase	F1,6DP	11,M	1
Isocitrate dehydrogenase	IDH	1,11,M	1
Leucine-aminopeptidase	LAP	6,8	1
Malate dehydrogenase	MDH	11,M	2
Malic enzyme	ME	11	1
Phosphoglucomutase	PGM	6	1
6-phosphoglucodehydrogenase	6-PGD	M	1
Shikimatedehydrogenase	SKD H	M	1
		Total Loci	12

Genetic Variation in Study Populations of *Juniperus osteosperma*

Population	Mean Observed Heterozygosity (H_o)	Mean Expected Heterozygosity (H_e)	Polymorphic Index (PI)	Mean Number of Alleles/ Locus (A)	Fixation Index (f)
Granite*	.140	.441	1.00	2.92	.686
Cedar*	.171	.359	1.00	2.83	.527
Dune*	.094	.393	1.00	2.83	.764
Valley	.307	.504	1.00	2.83	.394
Nephi	.256	.477	1.00	2.916	.466
All populations	.194	.435	1.00	2.87	.558

* Dugway populations exhibiting reduced fecundity

Distribution of Genetic Variation of *Juniperus osteosperma*

	Within population diversity (F_{IS})	Between population diversity (F_{IT})	Among population diversity (F_{ST})	Gene Flow (N_{em})
J. osteosperma	.566	.597	.071	2.52

The Big Picture:

- **Dugway Populations**

  The DPG populations have:

-- Lower seed set

-- Higher parasitism and abortion rates

-- Lower genetic variability

- **Valley/Nephi Populations**

The control populations have:

-- Higher seed set

-- Lower parasitism and abortion rates

-- Higher genetic variability

What Next?

Develop and implement recovery work for *Juniperus osteoperma* with certain goals in mind:

1). Put plans in place to decrease any further fragmentation of the juniper on DPG

2). Work to increase the number of less related individuals in the existing DPG populations.